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(71) 出願人 000004237

日本電気株式会社

東京都港区芝五丁目7番1号

(72) 発明者 土屋 泰章

東京都港区芝五丁目7番1号 日本電気株式会社内

(74) 代理人 100096253

弁理士 尾身 祐助

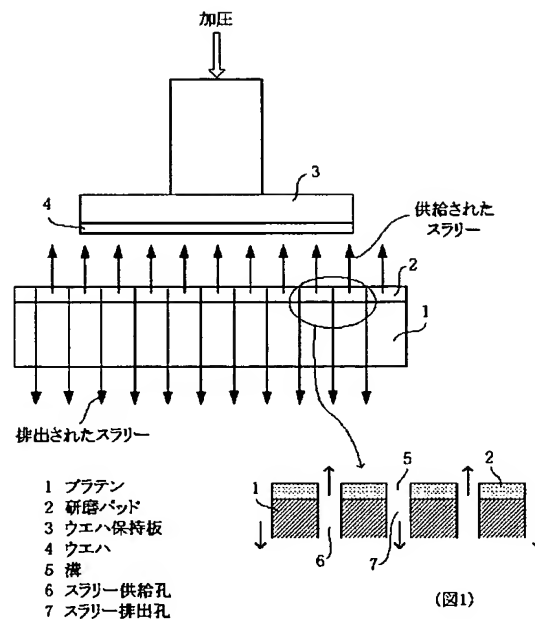
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(54) 【発明の名称】 化学的機械研磨装置

(57) 【要約】

【課題】 スラリーの未使用／使用済の比がウエハの面内で均一になるようにしてグローバルな平坦性の研磨面が得られるCMP装置を提供する。

【解決手段】 回転可能なプラテン1上には溝5が刻まれた研磨パッド2が取り付けられ、回転可能なウエハ保持板3の下面にはウエハ4が装着されており、ウエハ保持板3に荷重が加えられることにより、ウエハ4は研磨パッド2に押圧される。研磨パッド2に形成された溝5内に開孔するように、プラテン1にはスラリー供給孔6とスラリー排出孔7とが開設されており、スラリーの供給と排出のために用いられる。スラリーは、スラリー供給孔6を介して溝5内に供給され、その一部は溝から溢れて研磨パッド上に流れ研磨に使用される。使用済のスラリーは溝5内に流れ込んだ後、スラリー排出孔7を介して排出される。



## 【特許請求の範囲】

【請求項1】 回転可能なブラテンと、該ブラテン上に配置された研磨パッドと、ウエハを支持しウエハを前記研磨パッド上に押圧することのできる回転可能なウエハ支持体とを有する化学的機械研磨装置において、前記研磨パッドには溝が形成されており、該溝内にスラリーを供給することのできるスラリー供給孔とスラリーを排出するスラリー排出孔とが開口していることを特徴とする化学的機械研磨装置。

【請求項2】 前記スラリー供給孔が存在している溝と前記スラリー排出孔が存在している溝とが完全に分離されていることを特徴とする請求項1記載の化学的機械研磨装置。

【請求項3】 溝は直線状、ジグザグ状ないし波形形状をなして平行に複数本形成されており、前記スラリー供給孔と前記スラリー排出孔とはそれぞれ一つおきの溝内に存在していることを特徴とする請求項2記載の化学的機械研磨装置。

【請求項4】 前記溝は、平行に走る複数の第1種の溝と、該第1種の溝と交差して平行に走る複数の第2種の溝とを有しており、前記スラリー供給孔と前記スラリー排出孔とは、それぞれ溝の交点上に存在していることを特徴とする請求項1記載の化学的機械研磨装置。

【請求項5】 前記スラリー供給孔と前記スラリー排出孔とは、それぞれ一つおきの溝内に存在あり、かつ、前記スラリー供給孔と前記スラリー排出孔とは、それぞれ異なる溝内に配置されていることを特徴とする請求項4記載の化学的機械研磨装置。

【請求項6】 前記溝はジグザグ状ないし波形状にて複数本平行に形成されており、同一溝内に前記スラリー供給孔と前記スラリー排出孔とが交互に配置され、かつ、前記スラリー供給孔と前記スラリー排出孔との間には少なくとも一つの溝の屈曲部が介在していることを特徴とする請求項6記載の化学的機械研磨装置。

【請求項7】 前記スラリー排出孔にはスラリーを強制的に排出するポンプが備えられていることを特徴とする請求項1～6の何れかに記載の化学的機械研磨装置。

【請求項8】 スラリーは前記スラリー排出孔を介して自重により排出されることを特徴とする請求項1～6の何れかに記載の化学的機械研磨装置。

【請求項9】 前記スラリー供給孔と前記スラリー排出孔の穴径が0.5～5.0mmであることを特徴とする請求項1～8の何れかに記載の化学的機械研磨装置。

【請求項10】 前記研磨パッドの外周部は開放されており、スラリーは研磨パッドの外周部からも排出されることを特徴とする請求項1～9の何れかに記載の化学的機械研磨装置。

【請求項11】 1個のブラテン上に複数のウエハ保持板が配置されており、同時に複数枚のウエハの研磨が可能であるように構成されていることを特徴とする請求項

1～10の何れかに記載の化学的機械研磨装置。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、アルカリ性または酸性のエッチャントと砥粒とを含むスラリーを用いて化学的にエッチングを行いつつ機械的に研磨を行うための化学的機械研磨装置に関するものである。

【0002】

【従来の技術】平坦化された層間絶縁膜を形成するためやダマシン（damascene）構造の配線を形成するために、あるいは表面平坦性のよいSi層を有するSOI（silicon on insulator）を形成するために化学的機械研磨（chemical mechanical polishing: CMP）法が多用されている。そして、CMP法の用途が多様化したことによりさらに製作されるデバイスが高機能化されたことにより、化学的機械研磨装置（CMP装置）に課せられる加工精度も高いものが要求されるようになってきている。

【0003】図9は、従来のCMP装置の斜視図である。同図に示されるように、ブラテン21上には研磨パッド22が取り付けられている。ウエハ保持板23の下面にはウエハ24が装着されており、ウエハ保持板23に荷重が加えられることにより、ウエハ24は研磨パッド22に押圧される。研磨パッド22上にはスラリー供給口25が配置されており、この供給口よりスラリー26が研磨パッド22上に滴下される。

【0004】研磨パッド22上に滴下されたスラリーは研磨パッド上を拡がりウエハ24に到達する。ブラテン21とウエハ保持板23は矢印方向にすなわち同一方向に回転しており、これによりウエハと研磨パッドとが相対的に移動することになる。そして、研磨パッド22とウエハ24間にスラリーが侵入することによって研磨が行われる。使用済みのスラリーおよび使用されことなく研磨パッドの周辺部に到達したスラリーは研磨パッド周囲より滴下し、装置外に排除される。

【0005】

【発明が解決しようとする課題】上述した従来のCMP装置では、ウエハの周辺部には新鮮な（未使用の）スラリーが供給されるが、ウエハの中心付近ではウエハの周辺部の研磨に使用された後のスラリーのみが供給されるため、ウエハの端部と中央部においてスラリーの未使用／使用済の比が異なった状態で研磨が行われることになる。この点について更に詳しく説明する。ウエハ周辺部に供給された未使用のスラリーは、研磨パッド表面と被研磨物を有するウエハとの接触面に侵入して研磨剤として作用し、被研磨物の研磨除去のために使用される。研磨に使用されたスラリーは、被研磨物をイオン、酸化物、スラリー中に含まれる薬品との化合物（錯体を含む）、或いは、無反応無変化のまま含有する。さらにこれらと研磨砥粒が結合したものが生成される。さらに、

研磨前にバランス良く調整されたスラリーは、研磨により、酸、アルカリ、酸化剤、防食剤、界面活性剤などが消費されるため、使用後のスラリーは本来持つべき研磨特性を達成し得ない組成になっている。このように明らかに使用前の状態と異なる使用済みスラリーはウエハと研磨パッドの間で生成し、パッドの端から流れ落ちるまでパッド上を流れることになる。ここでウエハの中心付近で生成した使用済みスラリーは、その後、ウエハ端部に流れ出るまでの間、新たに供給されたスラリーと混ざりあいながら再度ウエハの中心より端に近い部分の研磨に使用されることになる。

【0006】従来のCMP方法では、上記のように、使用済のスラリーのみを用いて研磨の行われる領域が存在していること、ウエハ面内においてスラリーの組成の均一性が確保されていないことのため、

①研磨のウエハ面内均一性が低い、

②研磨後の被研磨物表面モロロジーが悪い、

③研磨物の再付着の可能性が高い、

④ダマシン配線形成時のエロージョン、ディッシング、リセスが大き、などの欠点があった。

【0007】また、従来のCMP装置においては、スラリーのうち未使用のまま研磨パッドの端部に到達して使用済のものとして排出される量が相当多いため、資材の使用効率が悪くコストアップの要因になっていた。本発明の課題は、上述した従来技術の問題点を解決することであって、その目的は、第1に、ウエハ面内でのスラリーの未使用/使用済の比の均一化を図ることであり、第2に、スラリーの使用効率を高めることである。

【0008】

【課題を解決するための手段】上記の目的を達成するため、本発明によれば、回転可能なプラテンと、該プラテン上に配置された研磨パッドと、ウエハを支持しウエハを前記研磨パッド上に押圧することのできる回転可能なウエハ支持体とを有する化学的機械研磨装置において、前記研磨パッドには溝が形成されており、該溝内にスラリーを供給することのできるスラリー供給孔とスラリーを排出するスラリー排出孔とが開口していることを特徴とする化学的機械研磨装置、が提供される。

【0009】そして、好ましくは、前記スラリー供給孔が存在している溝と前記スラリー排出孔が存在している溝とが完全に分離されている。あるいは、前記スラリー供給孔が存在している溝と前記スラリー排出孔が存在している溝とが連続して形成されている場合には、スラリー供給孔とスラリー排出孔との間には溝の屈曲部が存在するようになされる。

【0010】

【発明の実施の形態】図1は、本発明の実施の形態を説明するための、化学的機械研磨装置の概略構成図である。同図に示されるように、プラテン1上には研磨パッド2が取り付けられている。ウエハ保持板3の下面には

ウエハ4が装着されており、ウエハ保持板3に荷重が加えられることにより、ウエハ4は研磨パッド2に押圧される。プラテン1とウエハ保持板3とは共に回転する。

【0011】プラテン1と研磨パッド2の部分拡大断面図を右側に示す。研磨パッド2には溝5が形成されている。その溝内に開孔するように、プラテン1にはスラリー供給孔6とスラリー排出孔7とが開設されており、スラリーの供給と排出のために用いられる。スラリーは、図外スラリー供給装置よりスラリー供給孔6に向けて圧送され、溝5内に供給され、一部は溝から溢れて研磨パッド上に流れる。使用済のスラリーは溝5内に流れ込んだ後、スラリー排出孔7を介して排出される。スラリーは排出ポンプを用いて強制的に排出することもできるが、自重による落下に任せて排出するようにしてもよい。研磨パッド2の端部に到達したスラリーは落下して排除される。しかし、研磨パッドの周囲にスラリー流出防止壁を設けて全てのスラリーをスラリー排出孔7より排出するようにしてもよい。スラリー供給孔6上に開設された溝5と、スラリー排出孔7上に開設された溝5とが完全に分離していることが好ましいが、完全に分離されていない場合には、溝のスラリー供給孔6上に開設された部分と、スラリー排出孔7上に開設された部分との間に溝の屈曲部が少なくとも1個介在するようになされる。

【0012】スラリー供給孔およびスラリー排出孔の穴径は0.5～3.0mmの範囲が好ましく、スラリー供給孔およびスラリー排出孔の穴径は必ずしも同一である必要はない。スラリー供給孔とスラリー排出孔の穴径は研磨パッドの溝幅とほぼ同一かこれより幾分小さくされる。スラリー供給孔およびスラリー排出孔のそれぞれの間隔は0.5～3cmが好ましく、一つのスラリー排出孔とそれに最隣接するスラリー排出孔との直線距離は、一つのスラリー供給孔とそれに最隣接するスラリー供給孔との直線距離の0.5～5倍の範囲が好ましい。

【0013】

【実施例】次に、本発明の実施例について図面を参照して詳細に説明する。

【第1の実施例】図2は、本発明の第1の実施例の研磨パッド上を見た平面図とその部分拡大図である。プラテン上に貼り付けられた、厚さ2mmの研磨パッド2には、深さ1mm、幅1mmの溝5が5mm間隔で平行に形成されている。各溝には、スラリー供給孔6とスラリー排出孔7とが交互に形成されている。スラリー供給孔6とスラリー排出孔7スラリー供給孔6とスラリー排出孔7とは、それぞれ15mmの間隔で配置されており、またスラリー供給孔6とスラリー排出孔7とは互いに最も遠くなる位置に配置される。

【0014】図3、図4は、それぞれ図2のA-A線での断面図とB-B線での断面図である。図3に示されるように、図外スラリー供給装置より圧送されるスラリー

5 はスラリー供給管8を介して、プラテン1内の空洞9内に送り込まれた後、スラリー供給孔6により溝5内に供給される。また、図4に示されるように、溝5内に流れ込んだスラリーはスラリー排出孔7を介してスラリー溜め10に集められ、スラリー排出管11を介してスラリー排出ポンプ12により強制的に装置外へ排除される。なお、空洞9はプラテンの全面に広がるように1個設けられ、スラリー溜め10は各スラリー排出孔の配置された溝毎に形成されている。

【0015】このように構成された研磨装置において、スラリー供給孔とスラリー排出孔とが均等に配置されていることにより、ウエハ面内でのスラリーの未使用/使用済の比の不均一性を解消することができる。そして、スラリー供給孔より溝内に放出されたスラリーは溝を溢れ出て直ちに研磨のために使用されるため、研磨は常にフレッシュなスラリーを使用して行われることになる。特にダマシン構造の配線を形成する場合には本発明により大きな効果を得ることができる。すなわち配線Cu表面のケミカルエッチングによる荒れや削りカスによるスクラッチが低減し、また使用済スラリーのケミカル組成が変化することにより、配線金属/バリア膜/層間絶縁膜に対するスラリーの研磨速度の比がずれ、このことによりエロージョンが発生することを抑制できる。同様に、使用済スラリーのケミカル組成が変化して配線に対するケミカルエッチング性が増加することにより発生する配線上部のリセスや幅広配線のディッシングを抑制することができる。また、研磨物の配線表面への再付着防止にも効果がある。さらに、スラリー排出孔に到達するスラリーは研磨に使用されたもののみであるため、未使用のスラリーが排出されるという不都合が解消され資材の使用効率が向上する。

【0016】次に、本実施例装置を用いた実際の半導体装置の製造方法の一例について説明する。下層配線上に平坦な第1層間絶縁膜が形成され、第1層間絶縁膜に形成されたビア・ホールにはタングステンプラグが形成されている基板(ウエハ)を用意する。その上に、CVD法により膜厚500nmの第2の層間絶縁膜を形成した。そして、第2の層間絶縁膜にリソグラフィおよびドライエッチングを施して、タングステンプラグの表面を露出させる深さ500nmの配線溝を形成した。次に、スパッタ法によりバリアメタルとなるTaを50nmの膜厚に成膜し、続いてスパッタ法によりシードレイヤーとなるCuを100nmの膜厚に成膜した。その後、電解めっき法によりCuを800nm成膜した。これらの被研磨物を堆積したウエハをウエハ保持板に固定し、研磨パッドに押圧した状態で、研磨パッドを貼り付けたプラテンを回転させ、またウエハ保持板も同時に回転させる。このときパッドに設けられたスラリー供給孔からスラリーを250cc/minの流量で供給する。さらにこのときスラリーはスラリー排出孔を介して排出ポンプ

により、強制的に排出させる。このようにして、配線の表面荒れの少ない、かつ、エロージョン、リセスやディッシングの抑制されたダマシン構造の配線を得ることができた。

【0017】[第2の実施例] 図5は、本発明の第2の実施例の研磨パッド上をみた平面図である。図5において、図2に示した第1の実施例の部分と共通する部分には同一の参照番号が付けられているので重複する説明は省略するが、本実施例においては、溝は波形に形成されている。本実施例においてもスラリー供給孔6とスラリー排出孔7とは交互の溝内に設けられている。隣接する溝同士では波形は180°位相がずれており、スラリー供給孔6とスラリー排出孔7とは波形の同一位相位置を占めるようになされている。

【0018】[第3の実施例] 図6は、本発明の第3の実施例の研磨パッド上を見た平面図である。図5において、図2に示した第1の実施例の部分と共通する部分には同一の参照番号が付けられているので重複する説明は省略するが、本実施例においては、溝5は格子状に形成されている。そして、スラリー供給孔6とスラリー排出孔7とは横方向および縦方向の溝についてそれぞれ1本おきの溝内に設けられている。本実施例においては、スラリー供給孔6の配置された溝とスラリー排出孔7の配置された溝とが分離されていない。しかし、スラリー供給孔6とスラリー排出孔7とは溝により直線的に結合されていないため、すなわちスラリー供給孔6とスラリー排出孔7の間には溝の屈曲部が存在していることにより、スラリー供給孔より放出されるスラリーの大部分は研磨パッド2上に供給され、未使用のまま排出されるスラリー量は抑制されている。

【0019】[第4、5の実施例] 図7、図8は、本発明の第4、第5の実施例の研磨パッド上をみた平面図である。図7、図8において、図2に示した第1の実施例の部分と共通する部分には同一の参照番号が付けられているので重複する説明は省略するが、第4、第5の実施例の第1の実施例と相違する点は、溝5がジグザグ状ないし波形に形成されている点と、スラリー供給孔6とスラリー排出孔7とが同一の溝内に設けられている点である。第4、第5の実施例においては、スラリー供給孔6とスラリー排出孔7とが同一溝内に配置されているが、スラリー供給孔6とスラリー排出孔7の間には溝の屈曲部が介在しているため、第3の実施例の場合と同様に、スラリー供給孔より放出されるスラリーの大部分は研磨パッド2上に供給され、未使用のまま排出されるスラリー量は抑制されている。なお、図7、図8の実施例を変更して、第1、第2の実施例と同様に、スラリー供給孔6とスラリー排出孔7とがそれぞれ別々の溝内に配置されるようにしてもよい。

【0020】以上好ましい実施例について説明したが、本発明はこれらの実施例に限定されるものではなく、本

発明の要旨を変更しない範囲内において適宜の変更が可能である。例えば、プラテンに形成される空洞は面状に広がる形状のものではなく枝分かれしたものであってもよい。また、実施の形態では1個のプラテンに対し1個のウエハ保持板を対向させたものについて説明したが1個のプラテン（すなわち1枚の研磨パッド）に対し複数のウエハ保持板を対向させて複数枚のウエハを同時に処理することができるようにしてもよい。

【0021】

【発明の効果】以上説明したように、本発明による化学的機械研磨装置は、研磨パッドに形成された溝内にスラリー供給孔とスラリー排出孔とを配置して、被研磨ウエハの直下に直接スラリーを供給すると共に使用済のスラリーを遅滞なく排出するようにしたものであるため、以下の効果を享受することができる。

- ① 全ウエハ面を未使用の若しくは未使用に近い状態のスラリーにより研磨を行うことができる。
- ② ウエハ面での、スラリーの未使用／使用済の比の均一性を確保することができる。
- ③ 上記①および②により、表面荒れやスクラッチ傷がなく、かつ、エロージョンやディッシングが抑制されたグローバルな平坦性の高い研磨面を得ることができる。
- ④ 未使用のまま排出されるスラリーの量を少なくして資材の利用効率を高めることができる。

【図面の簡単な説明】

【図1】本発明の実施の形態を説明するための化学的機械研磨装置の概略図。

【図2】本発明の第1の実施例の研磨パッド上を見た平面\*

\* 面図。

【図3】図2のA-A線の断面図。

【図4】図2のB-B線の断面図。

【図5】本発明の第2の実施例の研磨パッド上を見た部分拡大平面図。

【図6】本発明の第3の実施例の研磨パッド上を見た平面図。

【図7】本発明の第4の実施例の研磨パッド上を見た部分拡大平面図。

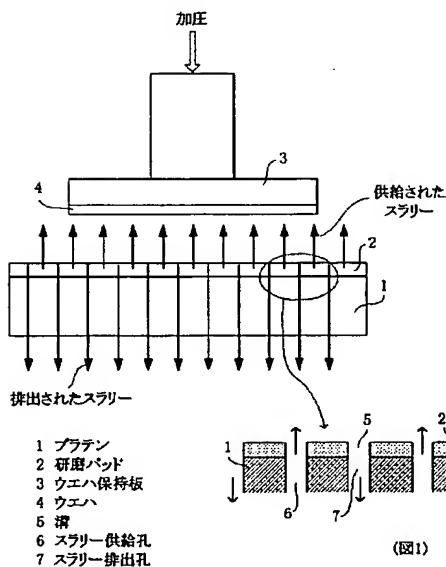
10 【図8】本発明の第5の実施例の研磨パッド上を見た部分拡大平面図。

【図9】従来例の斜視図。

【符号の説明】

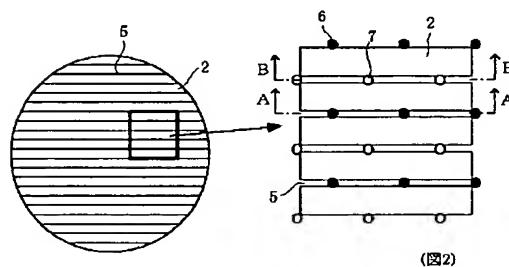
- 1、21 プラテン
- 2、22 研磨パッド
- 3、23 ウエハ保持板
- 4、24 ウエハ
- 5 溝
- 6 スラリー供給孔
- 7 スラリー排出孔
- 8 スラリー供給管
- 9 空洞
- 10 スラリー溜め
- 11 スラリー排出管
- 12 スラリー排出ポンプ
- 25 スラリー供給口
- 26 スラリー

【図1】

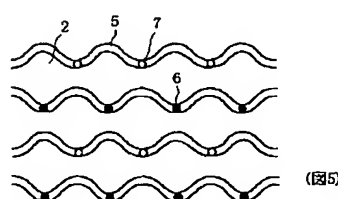


(図1)

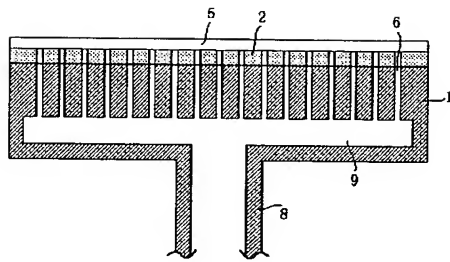
【図2】



【図5】



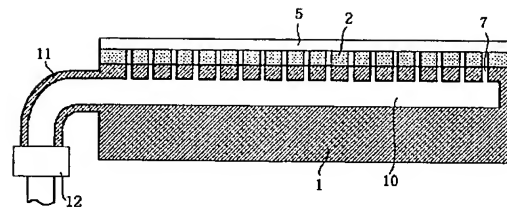
【図3】



8 スラリー供給管  
9 空洞

(図3)

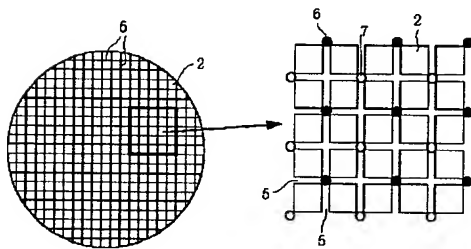
【図4】



10 スラリー溜め  
11 スラリー排出管  
12 スラリー排出ポンプ

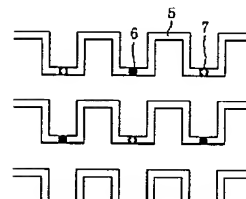
(図4)

【図6】



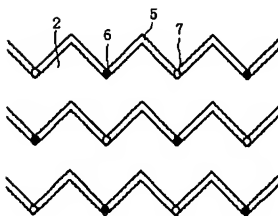
(図6)

【図7】



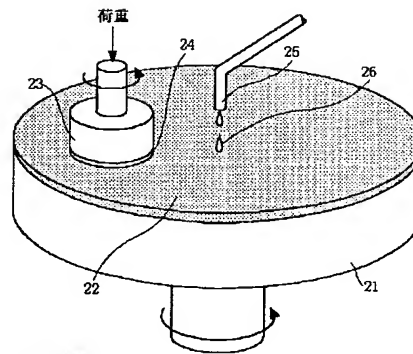
(図7)

【図8】



(図8)

【図9】



21 プラチン  
22 研磨パッド  
23 ウェハ保持板  
24 ウェハ  
25 スラリー供給口  
26 スラリー

(図9)

# PATENT ABSTRACTS OF JAPAN

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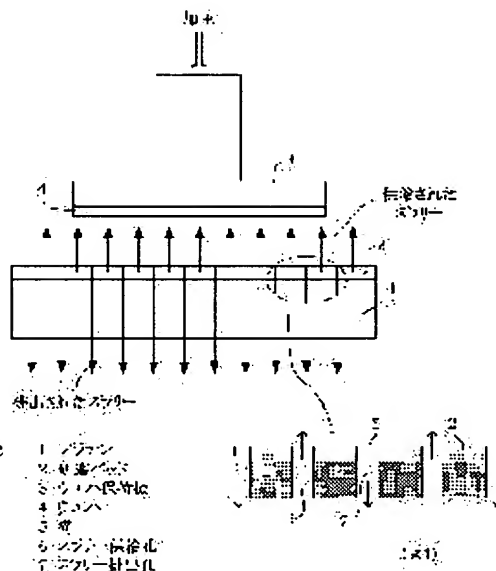
(72)Inventor : TSUCHIYA YASUAKI

## (54) CHEMICAL MACHINE POLISHING DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a CMP device for achieving a global and flat polished surface by setting the ratio of a slurry when not used to that when used to be uniform in a plane of a wafer.

**SOLUTION:** A polishing pad 2 with a groove 5 engraved is mounted on a rotatable platen 1 and a wafer 4 is mounted on the lower face of a rotatable wafer holding plate 3. By applying a load on the wafer holding plate 3, the wafer 4 is thrust against the polishing pad 2. The platen 1 has a slurry supply hole 6 and a slurry discharge hole 7 in communication with the groove 5 formed in the polishing pad 2 for the supply and discharge of a slurry. The slurry is supplied via the slurry supply hole 6 into the groove 5, part of which overflows from the groove and moves onto the polishing pad for use in polishing. The used slurry flows into the groove 5 and is then discharged via the slurry discharge hole 7.



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[Date of registration]

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[Date of requesting appeal against examiner's decision of  
rejection]

[Date of extinction of right]

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- 3.In the drawings, any words are not translated.

## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the chemical mechanical-polishing equipment for grinding mechanically, etching chemically using the slurry containing alkaline or acid etchant and an abrasive grain.

[0002]

[Description of the Prior Art] in order to form the interlayer insulation film by which flattening was carried out and to form wiring of DAMASHIN (damascene) structure, or in order to form SOI (silicon on insulator) which has good Si layer of surface surface smoothness -- chemical mechanical polishing (chemical mechanical polishing: CMP) -- law is used abundantly. And when the use of the CMP method was diversified, and the device manufactured further had advanced features, what also has the high process tolerance imposed on chemical mechanical-polishing equipment (CMP equipment) is required increasingly.

[0003] Drawing 9 is the perspective diagram of conventional CMP equipment. As shown in this drawing, the scouring pad 22 is attached on the platen 21. The underside of the wafer maintenance board 23 is equipped with the wafer 24, and a wafer 24 is pressed by the scouring pad 22 by adding a load to the wafer maintenance board 23. The slurry feed hopper 25 is arranged on the scouring pad 22, and a slurry 26 is dropped on a scouring pad 22 from this feed hopper.

[0004] The slurry dropped on the scouring pad 22 reaches the flare wafer 24 in a scouring pad top. The platen 21 and the wafer maintenance board 23 will rotate in the direction of an arrow head, i.e., the same direction, and a wafer and a scouring pad will move relatively by this. And polishing is performed when a slurry invades between a scouring pad 22 and a wafer 24. A used slurry and the used slurry which reached the periphery of a scouring pad, without being used are dropped from the perimeter of a scouring pad, and is eliminated out of equipment.

[0005]

[Problem(s) to be Solved by the Invention] Although a fresh (it is intact) slurry is supplied to the periphery of a wafer with the conventional CMP equipment mentioned above, since only the slurry after being used for polishing of the periphery of a wafer is supplied, near the center of a wafer, polishing will be performed in intact / the condition that used ratios differed of a slurry, in the edge and center section of a wafer. It explains in more detail about this point. The intact slurry supplied to the wafer periphery trespasses upon the contact surface of a scouring pad front face and the wafer which has a ground object, acts as an abrasive material, and is used for polishing clearance of a ground object. The slurry used for polishing contains a ground object, ion, an oxide, a compound (a complex is included) with the chemical contained in a slurry, or while [adiaphorous] it has been changeless. What these and a polishing abrasive grain furthermore combined is generated. Furthermore, as for the slurry adjusted with sufficient balance before polishing, an acid, alkali, an oxidizer, anticorrosives, a surfactant, etc. are consumed by polishing, and, for the \*\*\*\* reason, the slurry after an activity has become the presentation which cannot attain the polishing property which it should have essentially. Thus, a clearly different used slurry from the condition before an activity is generated between a wafer and a scouring pad, and it will flow a pad top until it flows and falls from the edge of a pad. The used slurry generated near the center of a wafer here will be used for polishing of the portion again near [center / of a wafer] an edge, being mixed with the newly supplied slurry until it flows into a wafer edge after that.

[0006] Since it is that the field where polishing is performed only using a used slurry exists as mentioned above by the conventional CMP method, and that the homogeneity of a presentation of a slurry is not secured in a wafer side, \*\* There was a defect, like the erosion at the time of \*\* DAMASHIN wiring formation with the high possibility of the reattachment of \*\* polishing object with the bad ground object surface morphology after \*\* polishing with the low homogeneity within a wafer side of polishing, dishing, and a recess are large.

[0007] Moreover, in conventional CMP equipment, since there were many amounts which arrive at the edge of a scouring pad among slurries while it has been intact, and are discharged as a used thing fairly, the utilization ratio of materials caused a cost rise bad. The technical problem of this invention is solving the trouble of the conventional technology mentioned above, it is attaining equalization of a used ratio and the object is the slurry in a wafer side being intact / 2nd raising the utilization ratio of a slurry the 1st.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned object, according to this invention, a pivotable platen, In chemical mechanical-polishing equipment which has a scouring pad arranged on this platen, and a pivotable wafer base material which can support a wafer and can press a wafer on said scouring pad A slot is formed in said scouring pad and chemical

mechanical-polishing equipment \*\* characterized by slurry feed holes which can supply a slurry in this slot, and a slurry discharge hole which discharges a slurry carrying out the opening is offered.

[0009] And a slot where said slurry feed holes exist, and a slot where said slurry discharge hole exists are separated thoroughly preferably. Or when a slot where said slurry feed holes exist, and a slot where said slurry discharge hole exists are formed continuously, between slurry feed holes and a slurry discharge hole, it is made as [ exist / a flection of a slot ].

[0010]

[Embodiment of the Invention] Drawing 1 is the outline block diagram of chemical mechanical-polishing equipment for explaining the gestalt of operation of this invention. As shown in this drawing, the scouring pad 2 is attached on the platen 1. The underside of the wafer maintenance board 3 is equipped with the wafer 4, and a wafer 4 is pressed by the scouring pad 2 by adding a load to the wafer maintenance board 3. Both a platen 1 and the wafer maintenance board 3 rotate.

[0011] The partial expanded sectional view of a platen 1 and a scouring pad 2 is shown in right-hand side. The slot 5 is formed in the scouring pad 2. The slurry feed holes 6 and the slurry discharge hole 7 are established by the platen 1, and it is used for it for supply of a slurry, and blowdown so that it may puncture to the Mizouchi. A slurry is fed towards the slurry feed holes 6 from the slurry feeder outside drawing, and it is supplied in a slot 5, and a part overflows from a slot and flows on a scouring pad. After a used slurry flows in in a slot 5, it is discharged through the slurry discharge hole 7. Although it can also discharge compulsorily using a drainage pump, he leaves a slurry to drop by self-weight, and you may make it discharge it. The slurry which arrived at the edge of a scouring pad 2 falls, and is eliminated. However, a slurry runoff prevention wall is prepared in the perimeter of a scouring pad, and you may make it discharge all slurries from the slurry discharge hole 7. Although it is desirable that the slot 5 established on the slurry feed holes 6 and the slot 5 established on the slurry discharge hole 7 have dissociated thoroughly, when not dissociating thoroughly, it is made as [ intervene / between the portion established on the slurry feed holes 6 of a slot, and the portion established on the slurry discharge hole 7 / at least one flection of a slot ].

[0012] The bore diameter of slurry feed holes and a slurry discharge hole needs to have the desirable range of 0.5-3.0mm, and the bore diameter of slurry feed holes and a slurry discharge hole does not necessarily need to be the same. The bore diameter of slurry feed holes and a slurry discharge hole is almost the same as the flute width of a scouring pad, or is made smaller [ for how many minutes ] than this. Each gap of slurry feed holes and a slurry discharge hole has 0.5-3 desirablecm, and the 0.5 to 5 times as many range of the slant range with the slurry discharge hole which carries out the nearest neighbors to one slurry discharge hole and it as a slant range with the slurry feed holes which carry out the nearest neighbors to one slurry feed holes and it is desirable.

[0013]

[Example] Next, the example of this invention is explained to details with reference to a drawing.

[1st example] drawing 2 is the plan which looked at the scouring pad top of the 1st example of this invention, and its elements on larger scale. The slot 5 with a depth [ of 1mm ] and a width of face of 1mm is formed in parallel at intervals of 5mm at the scouring pad 2 with a thickness of 2mm stuck on the platen. The slurry feed holes 6 and the slurry discharge hole 7 are formed in each slot by turns. The slurry feed holes 6, the slurry discharge hole 7 slurry feed holes 6, and the slurry discharge hole 7 are arranged at intervals of 15mm, respectively, and the slurry feed holes 6 and the slurry discharge hole 7 are arranged in the location which becomes mutual the furthest.

[0014] Drawing 3 and drawing 4 are a cross section in the A-A line of drawing 2, and a cross section in a B-B line, respectively. As shown in drawing 3, after the slurry fed from the slurry feeder outside drawing is sent in in the cavity 9 in a platen 1 through the slurry supply pipe 8, it is supplied by the slurry feed holes 6 in a slot 5. Moreover, as shown in drawing 4, the slurry which flowed in in the slot 5 is brought together in the slurry reservoir 10 through the slurry discharge hole 7, and is compulsorily eliminated out of equipment with the slurry drainage pump 12 through the slurry exhaust pipe 11. In addition, one cavity 9 is formed so that it may spread all over a platen, and the slurry reservoir 10 is formed for every slot where each slurry discharge hole has been arranged.

[0015] Thus, in the constituted polishing equipment, the heterogeneity of intact / used ratio of the slurry in a wafer side is cancelable by arranging slurry feed holes and a slurry discharge hole uniformly. And since the slurry emitted to Mizouchi from slurry feed holes overflows a slot and is promptly used for polishing, polishing will be performed using an always fresh slurry. When forming especially wiring of a pellet syn conformation, a big effect can be acquired by this invention. That is, when the scratch by the dry area by chemical etching and shaving dregs of a wiring Cu front face decreases and the chemical presentation of a used slurry changes, the ratio of the polishing speed of a slurry to a wiring metal / barrier film / interlayer insulation film shifts, and it can control that erosion occurs by this. The recess of the wiring upper part and dishing of broad wiring which are generated when similarly the chemical presentation of a used slurry changes and the chemical etching nature to wiring increases can be controlled. Moreover, there is an effect also in the reattachment prevention to the wiring front face of a polishing object. Furthermore, since the slurry which reaches a slurry discharge hole is only what was used for polishing, the inconvenience that an intact slurry is discharged is canceled and its utilization ratio of materials improves.

[0016] Next, an example of the manufacture method of the actual semiconductor device using this example equipment is explained. The substrate (wafer) with which the tungsten plug is formed is prepared for the beer hole which the 1st flat interlayer insulation film was formed on lower layer wiring, and was formed in the 1st interlayer insulation film. Moreover, the 2nd interlayer insulation film of 500nm of thickness was formed with the CVD method. And lithography and dry etching were performed to the 2nd interlayer insulation film, and the wiring gutter with a depth of 500nm in which the front face of a tungsten plug is exposed was formed. Next, Cu which forms Ta which serves as barrier metal by the spatter to 50nm thickness, and serves as a seed layer by the spatter continuously was formed to 100nm thickness. Then, 800nm of Cu(s) was formed by the electrolysis galvanizing method. The wafer which deposited these ground objects is fixed to a wafer maintenance board, and the platen which stuck the scouring pad is rotated in the condition of having pressed to the scouring pad, and a wafer maintenance board is also rotated simultaneously. A slurry is

supplied by the flow rate of 250 cc/min from the slurry feed holes prepared in the pad at this time. A slurry is made to discharge compulsorily with a drainage pump through a slurry discharge hole at this time furthermore. Thus, there are few surface dry areas of wiring, and the wiring of a pellet syn conformation with which erosion, a recess, and dishing were controlled was able to be obtained.

[0017] [2nd example] drawing 5 is the plan which saw the scouring pad top of the 2nd example of this invention. in drawing 5, the same reference number should give the portion of the 1st example shown in drawing 2, and a common portion -- although the explanation which overlaps in that of \*\*\*\*\* is omitted, the slot is formed in the wave in this example. Also in this example, the slurry feed holes 6 and the slurry discharge hole 7 are prepared for mutual Mizouchi. It is made in adjoining slots as [ occupy / about 180 degrees of phases have shifted and / a wave / the same phase location of a wave / discharge hole / 7 / the slurry feed holes 6 and / slurry ].

[0018] [3rd example] drawing 6 is the plan which looked at the scouring pad top of the 3rd example of this invention. in drawing 5, the same reference number should give the portion of the 1st example shown in drawing 2, and a common portion -- although the explanation which overlaps in that of \*\*\*\*\* is omitted, in this example, the slot 5 is formed in the shape of a grid. And the slurry feed holes 6 and the slurry discharge hole 7 are prepared for Mizouchi of an every other about the slot of a longitudinal direction and a lengthwise direction, respectively. In this example, the slot where the slurry feed holes 6 have been arranged, and the slot where the slurry discharge hole 7 has been arranged are not separated. However, since the slurry feed holes 6 and the slurry discharge hole 7 are not linearly combined by the slot, namely, when the flection of a slot exists between the slurry feed holes 6 and the slurry discharge hole 7, most slurries emitted from slurry feed holes are supplied on a scouring pad 2, and the slurry volume discharged while it has been intact is controlled.

[0019] [4th and 5 example] drawing 7 and drawing 8 are the plans which saw the scouring pad top of the 4th and 5th example of this invention. in drawing 7 and drawing 8, the same reference number should give the portion of the 1st example shown in drawing 2, and a common portion -- although the explanation which overlaps in that of \*\*\*\*\* is omitted, the point which is different from the 1st example of the 4th and 5th example is a point that the point that the slot 5 is formed in the shape of zigzag and a wave, and the slurry feed holes 6 and the slurry discharge hole 7 are prepared for the same Mizouchi. In the 4th and 5th example, although the slurry feed holes 6 and the slurry discharge hole 7 are arranged at the same Mizouchi, since the flection of a slot intervenes between the slurry feed holes 6 and the slurry discharge hole 7, most slurries emitted from slurry feed holes are supplied on a scouring pad 2 like the case where it is the 3rd example, and the slurry volume discharged while it has been intact is controlled. In addition, the example of drawing 7 and drawing 8 is changed and the slurry feed holes 6 and the slurry discharge hole 7 may be made to be arranged at respectively separate Mizouchi like the 1st and 2nd example.

[0020] Although the desirable example was explained above, proper modification is possible for this invention within limits which are not limited to these examples and do not change the summary of this invention. For example, the cavity formed in a platen is not the thing of the configuration which spreads in the shape of a field, and may branch. Moreover, although the thing which one wafer maintenance board was made to counter to one platen was explained, two or more wafer maintenance boards are made to counter to one platen (namely, scouring pad of one sheet), and you may enable it to process two or more wafers simultaneously with the gestalt of operation.

[0021]

[Effect of the Invention] As explained above, since the chemical mechanical-polishing equipment by this invention discharges a used slurry without delay while it arranges slurry feed holes and a slurry discharge hole to Mizouchi formed in the scouring pad and supplies a direct slurry directly under a ground wafer, it can enjoy the following effects.

\*\* All wafer sides have not been used or it can grind by the slurry of a near condition intact.

\*\* The homogeneity of intact / used ratio of a slurry in a wafer side is securable.

\*\* The high polished surface of global surface smoothness where there is neither a surface dry area nor a scratch blemish, and erosion and dishing were controlled by the above-mentioned \*\* and \*\* can be acquired.

\*\* The amount of the slurry discharged while it has been intact can be lessened, and the utilization effectiveness of materials can be raised.

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[Translation done.]

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CLAIMS

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[Claim(s)]

[Claim 1] Chemical mechanical-polishing equipment characterized by slurry feed holes which a slot is formed in said scouring pad and can supply a slurry in this slot in chemical mechanical-polishing equipment which has a pivotable platen, a scouring pad arranged on this platen, and a pivotable wafer base material which can support a wafer and can press a wafer on said scouring pad, and a slurry discharge hole which discharges a slurry carrying out the opening.

[Claim 2] Chemical mechanical-polishing equipment according to claim 1 characterized by separating thoroughly a slot where said slurry feed holes exist, and a slot where said slurry discharge hole exists.

[Claim 3] A slot is chemical mechanical-polishing equipment according to claim 2 which makes the shape of a straight line, the shape of zigzag, and a wave configuration, is formed in parallel two or more, and is characterized by said slurry feed holes and said slurry discharge hole existing in Mizouchi in every other one, respectively.

[Claim 4] two or more slots of the 1st sort which run said slot to parallel -- this -- chemical mechanical-polishing equipment according to claim 1 characterized by having two or more slots of the 2nd sort which intersect a slot of the 1st sort and are run to parallel, and said slurry feed holes and said slurry discharge hole existing on an intersection of a slot, respectively.

[Claim 5] Said slurry feed holes and said slurry discharge hole are chemical mechanical-polishing equipment according to claim 4 characterized by an existence cage, and said slurry feed holes and said slurry discharge hole being arranged by Mizouchi different, respectively at Mizouchi in every other one, respectively.

[Claim 6] Said slot is chemical mechanical-polishing equipment according to claim 6 characterized by being formed in two or more parallel in the shape of the shape of zigzag, and a wave, and arranging said slurry feed holes and said slurry discharge hole by turns at the same Mizouchi, and a flection of at least one slot intervening between said slurry feed holes and said slurry discharge holes.

[Claim 7] Chemical mechanical-polishing equipment given in any of claims 1-6 characterized by equipping said slurry discharge hole with a pump which discharges a slurry compulsorily they are.

[Claim 8] A slurry is chemical mechanical-polishing equipment given in any of claims 1-6 characterized by being discharged by self-weight through said slurry discharge hole they are.

[Claim 9] Chemical mechanical-polishing equipment given in any of claims 1-8 characterized by a bore diameter of said slurry feed holes and said slurry discharge hole being 0.5-5.0mm they are.

[Claim 10] It is chemical mechanical-polishing equipment given in any of claims 1-9 characterized by discharging a slurry also from the periphery section of a scouring pad the periphery section of said scouring pad is opened and they are.

[Claim 11] Chemical mechanical-polishing equipment given in any of claims 1-10 characterized by arranging two or more wafer maintenance boards on one platen, and being simultaneously constituted so that polishing of two or more wafers may be possible they are.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The schematic diagram of the chemical mechanical-polishing equipment for explaining the gestalt of operation of this invention.

[Drawing 2] The plan which looked at the scouring pad top of the 1st example of this invention.

[Drawing 3] The cross section of the A-A line of drawing 2 .

[Drawing 4] The cross section of the B-B line of drawing 2 .

[Drawing 5] The partial amplification plan which looked at the scouring pad top of the 2nd example of this invention.

[Drawing 6] The plan which looked at the scouring pad top of the 3rd example of this invention.

[Drawing 7] The partial amplification plan which looked at the scouring pad top of the 4th example of this invention.

[Drawing 8] The partial amplification plan which looked at the scouring pad top of the 5th example of this invention.

[Drawing 9] The perspective diagram of the conventional example.

[Description of Notations]

1 21 Platen

2 22 Scouring pad

3 23 Wafer maintenance board

4 24 Wafer

5 Slot

6 Slurry Feed Holes

7 Slurry Discharge Hole

8 Slurry Supply Pipe

9 Cavity

10 Slurry Reservoir

11 Slurry Exhaust Pipe

12 Slurry Drainage Pump

25 Slurry Feed Hopper

26 Slurry

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[Translation done.]

# PATENT ABSTRACTS OF JAPAN

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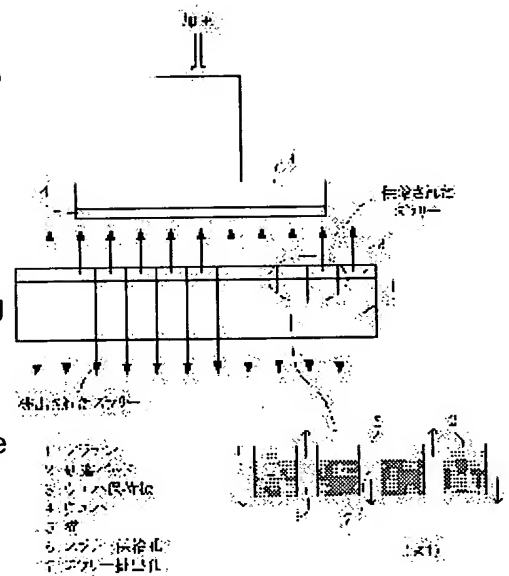
(72)Inventor : TSUCHIYA YASUAKI

## (54) CHEMICAL MACHINE POLISHING DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a CMP device for achieving a global and flat polished surface by setting the ratio of a slurry when not used to that when used to be uniform in a plane of a wafer.

**SOLUTION:** A polishing pad 2 with a groove 5 engraved is mounted on a rotatable platen 1 and a wafer 4 is mounted on the lower face of a rotatable wafer holding plate 3. By applying a load on the wafer holding plate 3, the wafer 4 is thrust against the polishing pad 2. The platen 1 has a slurry supply hole 6 and a slurry discharge hole 7 in communication with the groove 5 formed in the polishing pad 2 for the supply and discharge of a slurry. The slurry is supplied via the slurry supply hole 6 into the groove 5, part of which overflows from the groove and moves onto the polishing pad for use in polishing. The used slurry flows into the groove 5 and is then discharged via the slurry discharge hole 7.



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## CLAIMS

[Claim(s)]

[Claim 1] Chemical mechanical-polishing equipment characterized by the slurry feed holes which the slot is formed in said scouring pad and can supply a slurry in this slot in the chemical mechanical-polishing equipment which has a pivotable platen, the scouring pad arranged on this platen, and the pivotable wafer base material which can support a wafer and can press a wafer on said scouring pad, and the slurry discharge hole which discharges a slurry carrying out opening.

[Claim 2] Chemical mechanical-polishing equipment according to claim 1 characterized by separating completely the slot where said slurry feed holes exist, and the slot where said slurry discharge hole exists.

[Claim 3] A slot is chemical mechanical-polishing equipment according to claim 2 which makes the shape of a straight line, the shape of zigzag, and a wave configuration, is formed two or more in parallel, and is characterized by said slurry feed holes and said slurry discharge hole existing in Mizouchi in every other one, respectively.

[Claim 4] two or more slots of the 1st sort which run said slot in parallel -- this -- the chemical mechanical-polishing equipment according to claim 1 characterized by having two or more slots of the 2nd sort which intersect the slot of the 1st sort and are run in parallel, and said slurry feed holes and said slurry discharge hole existing on the intersection of a slot, respectively.

[Claim 5] Said slurry feed holes and said slurry discharge hole are chemical mechanical-polishing equipment according to claim 4 characterized by the existence cage, and said slurry feed holes and said slurry discharge hole being arranged by Mizouchi different, respectively at Mizouchi in every other one, respectively.

[Claim 6] Said slot is chemical mechanical-polishing equipment according to claim 6 characterized by being formed in two or more parallel in the shape of the shape of zigzag, and a wave, and arranging said slurry feed holes and said slurry discharge hole by turns at the same Mizouchi, and the flecion of at least one slot intervening between said slurry feed holes and said slurry discharge holes.

[Claim 7] Chemical mechanical-polishing equipment given in any of claims 1-6 characterized by equipping said slurry discharge hole with the pump which discharges a slurry compulsorily they are.

[Claim 8] A slurry is chemical mechanical-polishing equipment given in any of claims 1-6 characterized by being discharged by self-weight through said slurry discharge hole they are.

[Claim 9] Chemical mechanical-polishing equipment given in any of claims 1-8 characterized by the bore diameter of said slurry feed holes and said slurry discharge hole being 0.5-5.0mm they are.

[Claim 10] It is chemical mechanical-polishing equipment given in any of claims 1-9 characterized by discharging a slurry also from the periphery section of a scouring pad the periphery section of said scouring pad is opened wide, and they are.

[Claim 11] Chemical mechanical-polishing equipment given in any of claims 1-10 characterized by



arranging two or more wafer maintenance plates on one platen, and being constituted so that polish of two or more wafers may be possible to coincidence they are.

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the chemical mechanical-polishing equipment for grinding mechanically, etching chemically using the slurry containing alkaline or acid etchant and an abrasive grain.

[0002]

[Description of the Prior Art] in order to form the interlayer insulation film by which flattening was carried out and to form wiring of DAMASHIN (damascene) structure, or in order to form SOI (silicon on insulator) which has good Si layer of surface surface smoothness -- chemical mechanical polishing (chemical mechanical polishing: CMP) -- law is used abundantly. And when the application of the CMP method was diversified, and the device manufactured further had advanced features, what also has the high process tolerance imposed on chemical mechanical-polishing equipment (CMP equipment) is required increasingly.

[0003] Drawing 9 is the perspective view of conventional CMP equipment. As shown in this drawing, the scouring pad 22 is attached on the platen 21. The inferior surface of tongue of the wafer maintenance plate 23 is equipped with the wafer 24, and a wafer 24 is pressed by the scouring pad 22 by adding a load to the wafer maintenance plate 23. The slurry feed hopper 25 is arranged on the scouring pad 22, and a slurry 26 is dropped on a scouring pad 22 from this feed hopper.

[0004] The slurry dropped on the scouring pad 22 spreads a scouring pad top, and reaches a wafer 24. The platen 21 and the wafer maintenance plate 23 will rotate in the direction of an arrow head, i.e., the same direction, and a wafer and a scouring pad will move relatively by this. And polish is performed when a slurry invades between a scouring pad 22 and a wafer 24. A used slurry and the used slurry which reached the periphery of a scouring pad, without being used are dropped from the perimeter of a scouring pad, and is eliminated out of equipment.

[0005]

[Problem(s) to be Solved by the Invention] Although a fresh (it is intact) slurry is supplied to the periphery of a wafer with the conventional CMP equipment mentioned above, since only the slurry after being used for polish of the periphery of a wafer is supplied, near the core of a wafer, polish will be performed in intact / the condition that used ratios differed of a slurry, in the edge and center section of a wafer. It explains in more detail about this point. The intact slurry supplied to the wafer periphery trespasses upon the contact surface of a scouring pad front face and the wafer which has a ground object, acts as an abrasive material, and is used for polish removal of a ground object. The slurry used for polish contains a ground object, ion, an oxide, a compound (a complex is included) with the chemical contained in a slurry, or while [adiaphorous] it has been changeless.

What these and a polish abrasive grain furthermore combined is generated. Furthermore, as for the slurry adjusted with sufficient balance before polish, an acid, alkali, an oxidizer, anticorrosives, a surfactant, etc. are consumed by polish, and, for the \*\*\*\* reason, the slurry after use has become the presentation which cannot attain the polish property which it should have essentially. Thus, a clearly different used slurry from the condition before use is generated between a wafer and a scouring pad, and it will flow a pad top until it flows and falls from the edge of a pad. The used slurry generated near the core of a wafer here will be used for polish of the part again near [ core / of a wafer ] an edge, being mixed with the newly supplied slurry until it flows into a wafer edge after that.

[0006] Since it is that the field where polish is performed only using a used slurry exists as mentioned above by the conventional CMP approach, and that the homogeneity of a presentation of a slurry is not secured in a wafer side, \*\* There was a fault, like the erosion at the time of \*\* DAMASHIN wiring formation with the high possibility of the reattachment of \*\* polish object with the bad ground object surface morphology after \*\* polish with the low homogeneity within a wafer side of polish, dishing, and a recess are large.

[0007] Moreover, in conventional CMP equipment, since there were many amounts which arrive at the edge of a scouring pad among slurries while it has been intact, and are discharged as a used thing fairly, the utilization ratio of materials caused a cost rise bad. The technical problem of this invention is solving the trouble of the conventional technique mentioned above, it is attaining equalization of a used ratio and the purpose is the slurry in a wafer side being intact / 2nd raising the utilization ratio of a slurry the 1st.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, according to this invention, a pivotable platen, In the chemical mechanical-polishing equipment which has the scouring pad arranged on this platen, and the pivotable wafer base material which can support a wafer and can press a wafer on said scouring pad The slot is formed in said scouring pad and chemical mechanical-polishing equipment \*\* characterized by the slurry feed holes which can supply a slurry in this slot, and the slurry discharge hole which discharges a slurry carrying out opening is offered.

[0009] And the slot where said slurry feed holes exist, and the slot where said slurry discharge hole exists are separated completely preferably. Or when the slot where said slurry feed holes exist, and the slot where said slurry discharge hole exists are formed continuously, between slurry feed holes and a slurry discharge hole, it is made as [ exist / the flection of a slot ].

[0010]

[Embodiment of the Invention] Drawing 1 is the outline block diagram of chemical mechanical-polishing equipment for explaining the gestalt of operation of this invention. As shown in this drawing, the scouring pad 2 is attached on the platen 1. The inferior surface of tongue of the wafer maintenance plate 3 is equipped with the wafer 4, and a wafer 4 is pressed by the scouring pad 2 by adding a load to the wafer maintenance plate 3. Both a platen 1 and the wafer maintenance plate 3 rotate.

[0011] The partial expanded sectional view of a platen 1 and a scouring pad 2 is shown in right-hand side. The slot 5 is formed in the scouring pad 2. The slurry feed holes 6 and the slurry discharge hole 7 are established by the platen 1, and it is used for it for supply of a slurry, and discharge so that it may puncture to the Mizouchi. A slurry is fed towards the slurry feed holes 6 from the slurry feeder outside drawing, and it is supplied in a slot 5, and a part overflows from a slot and flows on a scouring pad. After a used slurry flows in in a slot 5, it is discharged through the

slurry discharge hole 7. Although it can also discharge compulsorily using an eductor pump, he leaves a slurry to fall by self-weight, and you may make it discharge it. The slurry which arrived at the edge of a scouring pad 2 falls, and is eliminated. However, a slurry outflow prevention wall is prepared in the perimeter of a scouring pad, and you may make it discharge all slurries from the slurry discharge hole 7. Although it is desirable that the slot 5 established on the slurry feed holes 6 and the slot 5 established on the slurry discharge hole 7 have dissociated completely, when not dissociating completely, it is made as [ intervene / between the part established on the slurry feed holes 6 of a slot, and the part established on the slurry discharge hole 7 / at least one flexion of a slot ].

[0012] The bore diameter of slurry feed holes and a slurry discharge hole needs to have the desirable range of 0.5-3.0mm, and the bore diameter of slurry feed holes and a slurry discharge hole does not necessarily need to be the same. The bore diameter of slurry feed holes and a slurry discharge hole is almost the same as the flute width of a scouring pad, or is made smaller [ for how many minutes ] than this. Each spacing of slurry feed holes and a slurry discharge hole has 0.5-3 desirablecm, and the 0.5 to 5 times as much range of the slant range with the slurry discharge hole which carries out the nearest neighbors to one slurry discharge hole and it as a slant range with the slurry feed holes which carry out the nearest neighbors to one slurry feed holes and it is desirable.

[0013]

[Example] Next, the example of this invention is explained to a detail with reference to a drawing.

[1st example] drawing 2 is the top view which looked at the scouring pad top of the 1st example of this invention, and its partial enlarged drawing. The slot 5 with a depth [ of 1mm ] and a width of face of 1mm is formed in the scouring pad 2 with a thickness of 2mm stuck on the platen in parallel at intervals of 5mm. The slurry feed holes 6 and the slurry discharge hole 7 are formed in each slot by turns. The slurry feed holes 6, the slurry discharge hole 7 slurry feed holes 6, and the slurry discharge hole 7 are arranged at intervals of 15mm, respectively, and the slurry feed holes 6 and the slurry discharge hole 7 are arranged in the location which becomes mutual the furthest.

[0014] Drawing 3 and drawing 4 are a sectional view in the A-A line of drawing 2 , and a sectional view in a B-B line, respectively. As shown in drawing 3 , after the slurry fed from the slurry feeder outside drawing is sent in in the cavity 9 in a platen 1 through the slurry supply pipe 8, it is supplied by the slurry feed holes 6 in a slot 5. Moreover, as shown in drawing 4 , the slurry which flowed in in the slot 5 is brought together in the slurry reservoir 10 through the slurry discharge hole 7, and is compulsorily eliminated out of equipment with the slurry eductor pump 12 through the slurry exhaust pipe 11. In addition, one cavity 9 is formed so that it may spread all over a platen, and the slurry reservoir 10 is formed for every slot where each slurry discharge hole has been arranged.

[0015] Thus, in the constituted polish equipment, the heterogeneity of intact / used ratio of the slurry in a wafer side is cancelable by arranging slurry feed holes and a slurry discharge hole equally. And since the slurry emitted to Mizouchi from slurry feed holes overflows a slot and is immediately used for polish, polish will be performed using an always fresh slurry. When forming especially wiring of a pellet syn conformation, big effectiveness can be acquired by this invention. That is, when the scratch by the dry area by chemical etching and shaving dregs of a wiring Cu front face decreases and the chemical presentation of a used slurry changes, the ratio of the polish rate of a slurry to a wiring metal / barrier film / interlayer insulation film shifts, and it can control that erosion occurs by this. The recess of the wiring upper part and dishing of broad wiring which are generated when similarly the chemical presentation of a used slurry changes and the chemical etching nature to wiring increases can be controlled. Moreover, there is effectiveness also in the reattachment prevention to the wiring front face of a polish object. Furthermore, since the slurry

which reaches a slurry discharge hole is only what was used for polish, un-arranging [ that an intact slurry is discharged ] is canceled and its utilization ratio of materials improves.

[0016] Next, an example of the manufacture approach of the actual semiconductor device using this example equipment is explained. The substrate (wafer) with which the tungsten plug is formed is prepared for the beer hole which the 1st flat interlayer insulation film was formed on lower layer wiring, and was formed in the 1st interlayer insulation film. Moreover, the 2nd interlayer insulation film of 500nm of thickness was formed with the CVD method. And lithography and dry etching were given to the 2nd interlayer insulation film, and the wiring gutter with a depth of 500nm in which the front face of a tungsten plug is exposed was formed. Next, Cu which forms Ta which serves as barrier metal by the spatter to 50nm thickness, and serves as a seed layer by the spatter continuously was formed to 100nm thickness. Then, 800nm of Cu(s) was formed by the electrolysis galvanizing method. The wafer which deposited these ground objects is fixed to a wafer maintenance plate, and the platen which stuck the scouring pad is rotated in the condition of having pressed to the scouring pad, and coincidence is made to also rotate a wafer maintenance plate. A slurry is supplied by the flow rate of 250 cc/min from the slurry feed holes prepared in the pad at this time. A slurry is made to discharge compulsorily with an eductor pump through a slurry discharge hole at this time furthermore. Thus, there are few surface dry areas of wiring, and wiring of a pellet syn conformation with which erosion, a recess, and dishing were controlled was able to be obtained.

[0017] [2nd example] drawing 5 is the top view which saw the scouring pad top of the 2nd example of this invention. in drawing 5 , the same reference number should give the part of the 1st example shown in drawing 2 , and a common part -- although the explanation which overlaps in that of \*\*\*\*\* is omitted, the slot is formed in the wave in this example. Also in this example, the slurry feed holes 6 and the slurry discharge hole 7 are prepared for mutual Mizouchi. It is made in adjoining slots as [ occupy / about 180 degrees of phases have shifted and / a wave / the same phase location of a wave / discharge hole / 7 / the slurry feed holes 6 and / slurry ].

[0018] [3rd example] drawing 6 is the top view which looked at the scouring pad top of the 3rd example of this invention. in drawing 5 , the same reference number should give the part of the 1st example shown in drawing 2 , and a common part -- although the explanation which overlaps in that of \*\*\*\*\* is omitted, in this example, the slot 5 is formed in the shape of a grid. And the slurry feed holes 6 and the slurry discharge hole 7 are prepared for Mizouchi of an every other about the slot of a longitudinal direction and a lengthwise direction, respectively. In this example, the slot where the slurry feed holes 6 have been arranged, and the slot where the slurry discharge hole 7 has been arranged are not separated. However, since the slurry feed holes 6 and the slurry discharge hole 7 are not linearly combined by the slot, namely, when the flection of a slot exists between the slurry feed holes 6 and the slurry discharge hole 7, most slurries emitted from slurry feed holes are supplied on a scouring pad 2, and the slurry volume discharged while it has been intact is controlled.

[0019] [4th and 5 example] drawing 7 and drawing 8 are the top views which saw the scouring pad top of the 4th and 5th example of this invention. in drawing 7 and drawing 8 , the same reference number should give the part of the 1st example shown in drawing 2 , and a common part -- although the explanation which overlaps in that of \*\*\*\*\* is omitted, the point which is different from the 1st example of the 4th and 5th example is a point that the point that the slot 5 is formed in the shape of zigzag and a wave, and the slurry feed holes 6 and the slurry discharge hole 7 are prepared for the same Mizouchi. In the 4th and 5th example, although the slurry feed holes 6 and the slurry discharge hole 7 are arranged at the same Mizouchi, since the flection of a slot

intervenes between the slurry feed holes 6 and the slurry discharge hole 7, most slurries emitted from slurry feed holes are supplied on a scouring pad 2 like the case where it is the 3rd example, and the slurry volume discharged while it has been intact is controlled. In addition, the example of drawing 7 and drawing 8 is changed and the slurry feed holes 6 and the slurry discharge hole 7 may be made to be arranged at respectively separate Mizouchi like the 1st and 2nd example.

[0020] Although the desirable example was explained above, proper modification is possible for this invention within limits which are not limited to these examples and do not change the summary of this invention. For example, the cavity formed in a platen is not the thing of the configuration which spreads in the shape of a field, and may branch. Moreover, although the thing which one wafer maintenance plate was made to counter to one platen was explained, two or more wafer maintenance plates are made to counter to one platen (namely, scouring pad of one sheet), and you may enable it to process two or more wafers to coincidence with the gestalt of operation.

[0021]

[Effect of the Invention] As explained above, since the chemical mechanical-polishing equipment by this invention discharges a used slurry without delay while it arranges slurry feed holes and a slurry discharge hole to Mizouchi formed in the scouring pad and supplies a direct slurry directly under a ground wafer, it can enjoy the following effectiveness.

- \*\* All wafer sides have not been used or it can grind by the slurry of a near condition intact.
- \*\* The homogeneity of intact / used ratio of a slurry in a wafer side is securable.
- \*\* The high polished surface of global surface smoothness where there is neither a surface dry area nor a scratch blemish, and erosion and dishing were controlled by the above-mentioned \*\* and \*\* can be acquired.
- \*\* The amount of the slurry discharged while it has been intact can be lessened, and the use effectiveness of materials can be raised.

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[Translation done.]